REMARKS

Claims 1 and 4 are pending in the patent application.

I. Obviousness-type Double Patenting Rejection

The Examiner has rejected claim 1 under the judicially created doctrine of obviousness-type double patenting. The Examiner contends that claim 1 is unpatentable over claims 10-12 of U.S. Patent No. 6,660,419 of Nishida, *et al.* ("Nishida"), considered in view of U.S. Patent No. 6,348,279 of Saito, *et al.* ("Saito").

The applicants have submitted herewith an executed Terminal Disclaimer and Statement of Common Ownership. In view of this Statement, it is respectfully submitted that the double patenting rejection is no longer applicable. Reconsideration and withdrawal of the rejection is requested.

II. Rejection Under 35 U.S.C. § 103 Based Upon U.S. Patent No. 5,607,785 of Tozawa, *et al.* taken in view of U.S. Patent Application Publication 2002/0034672 of Saito, *et al.*, Further Taken in View of U.S. Patent No. 6,348,279 of Saito, *et al.*

The Examiner has rejected claim 1 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,607,785 of Tozawa, *et al.* ("Tozawa"), taken in view of U.S. Patent Application Publication 2002/0034672 of Saito, *et al.* ("Saito application"), further considered in view of U.S. Patent No. 6,348,279 of Saito, *et al.* ("Saito patent").

The applicants respectfully traverse the rejection.

As a threshold matter, the applicants are unclear as to why the Examiner refers to claim 3 in the Office Action (at pages 7 and 8), as this claim is no longer pending in the application. Accordingly, the applicants have not addressed the arguments with respect to claim 3.

The Examiner relies upon Tozawa as disclosing the basic structure of a polymer-electrolyte fuel cell having separators 6a and 6c with current collector portions 7a and 7c to which a load 8 is applied to withdraw electric power. On this basis the Examiner concludes that the separator material must be a conductive material, even though this characteristic of the separator is not expressly disclosed in Tozawa.

The Examiner does concede that Tozawa does not disclose a separator comprising a metal substrate and an electroconductive resin layer provided on said metal substrate wherein the

electroconductive resin layer comprises a resin having at least one of a water repellant and basic radical, and an electroconductive particulate substance which comprises a vitreous carbon powder having a specific surface area of less than 100 m^2/g.

The Examiner attempts to remedy these deficiencies by asserting disclosures of the Saito application and the Saito patent. The Saito application (which the Examiner refers to as Saito '672) is relied upon to show a fuel cell separator having a film on its surface. According to the Examiner, the Saito separator comprises a conductive coating of a particular composition on a base material, the base material is a metal material, *e.g.,* titanium, aluminum, stainless steel which can be shaped into a separator. The base material includes a conductive powder and a binder. The conductive powder includes, for example, a powder of a carbon material typified by natural graphite, acetylene black, carbon black and the binder may be a thermosetting resin, thermoplastic resin, rubber, or the like, such as polyamideimide and fluoro resins. The Examiner contends that polyamideimide resin is a resin having a "basic radical."

The Examiner relies upon the Saito patent as disclosing a separator wherein the separator is a composite material obtained by coating a metal material with a resin, glassy carbon or a metal. The Examiner concludes that "glassy carbon" is also vitreous carbon. The Examiner contends that because "vitreous carbon powder" is allegedly the same as "glassy carbon," the glassy carbon disclosed in the reference inherently has a surface area of 100 m^2/g. Thus, the Examiner reasons that it would have been obvious to one skilled in the art at the time the invention was made to use the resin layer comprising the "vitreous carbon" of the Saito application on a separator of Tozawa and the Saito patent because the Saito application teaches that the specified resin layer provides a separator for polymer electrolyte fuel cells.

The Examiner has rejected claim 4 under 35 U.S.C. § 103(a) as being unpatentable over the combination described above, in addition, to the reference Japanese Publication JP 11-126620. However, as claim 4 depends from claim 1, the Examiner's failure to establish a *prima facie* case of obviousness of claim 1 applies to claim 4 as well.

With respect to each of claims 1 and 4, the Examiner has failed to meet the requirements for a showing of obviousness. In particular, the combinations proposed by the Examiner do not teach or suggest each element of the invention, nor would a person of ordinary skill in the art have made the combination suggested by the Examiner. First, the Saito patent does not disclose use of vitreous carbon having a specific surface area of less than 100 m^2/g. The Examiner's

reasoning that, since glassy carbon and vitreous carbon are the same they must have the same surface areas, is flawed. While a powder may comprise an identical chemical entity, it follows neither logically nor technically that the powder has an identical physical structure. Thus, since inherent elements must be shown to be necessarily present and not possibly or probably present. The Examiner has failed to demonstrate that all elements of the invention are present in the proposed combination.

Moreover, there is no teaching or suggestion that a person of ordinary skill in the art at the time the invention was made would have made the combination proposed by the Examiner. The Examiner has failed to consider the actual problems and solutions with which the present inventors and the Saito inventors were concerned. The particular composition of the electroconductive resin layer of the separators in the fuel cell of the present invention was developed to solve the problem of corrosion of the metal substrate of the separator and resultant damage to the membrane electrode assembly (MEA) due to metal ions leaching from the metal substrate of the separator in the MEA. As discussed at pages 3 and 4 of the present application, electroconnective separators utilizing metal substrates require strong corrosion resistance due to long term exposure to high humidity gases. Additionally, it is important to suppress contact resistance between the electroconductive separator and the MEA in order to heighten the electric cells' power generating efficiency. A number of solutions to this problem have been proposed by the prior art, but these solutions have been inadequate, because either the stable passive state layer provided on the substrate increases contact resistance, or there are problems with durability such that, when the cells are run long-term, the metal ions leach out of the metal substrate and cause MEA damage.

To address these difficulties, the present invention provides an electroconductive resin layer comprising a resin having water-repellant and/or basic radicals and an electroconductive particulate substance comprising carbon powder particles having a specific surface area of less than 100 m^2/g. These particles comprise vitreous carbon. The reasons that the particular features of the invention are successful in alleviating the problems of the prior art are discussed in more detail at pages 6-10 of the specification. In particular, water is produced at the cathode by galvanic reaction and water vapor is thought to condense in the area where the electroconductive separators and the gas diffusion electrodes contact. Carbon dioxide gas and ionic impurities dissolve in the condensed water vapor, and corrosion of the metal substrate of

the separator develops as a result. By providing an electroconductive resin layer in which the resin has water repellant and/or basic radicals, ionicly conductive water is prevented from permeating the electroconnective resin layer and from reaching the surface of the metal substrate. In addition, the leaching of metal ions from the metal substrate is restrained by including on the surface of the metal substrate a layer containing such metals as zinc, tin, or aluminum, or oxides or hydroxides of chromium, molybedenum, or tungsten. None of these problems or solutions is suggested or discussed in either the Saito patent or the Saito application. To the contrary, the Saito patent is directed to producing a fuel cell separator having superior hydrophilicity and water-holding capacity, while at the same time having electrical resistance. In order to achieve these objectives, the conductive powder is subject to a hydrophilization treatment by control of firing conditions or by using a chemical, a gas or the like. Separators of the Saito application having satisfactory hydrophilicity at the surface hold 0.3 or more grams water per gram of unit weight of the film. As shown in Figure 1, the conductive coating is filled with holes and unevenness resulting from the removal of perishable additives and the secondary particles of the conductive powder.

Thus, it is apparent that the surface area of the electroconductive particles of the Saito application must be designed as large as possible in order to provide the porosity necessary to hold water. In contrast, the surface area of the electroconductive particles of the present invention are less than 100 m^2/g and preferably, as small as possible, in order to decrease the interface between the resin and the electroconductive particles to inhibit dispersion of metal ions leached from the metal substrate to the exterior of the electroconductive separator. Thus, a person of skill in the art would not have been motivated to make the combination of Tozawa, the Saito application, and the Saito patent in order to arrive at the present invention.

CONCLUSION

In view of the foregoing, it is respectively submitted that claims 1 and 4 are patentable distinguished over the cited prior art. Reconsideration and allowance of claims 1 and 4 at the earliest opportunity is respectfully solicited.

Respectfully submitted,

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